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RESPONSIVENESS SUMMARY FOR THE ENGINEERING EVALUATION/ COST ANALYSIS FOR THE PROPOSED MANAGEMENT OF CONTAMINATED WATER IN THE WELDON SPRING QUARRY

by

Energy and Environmental Systems Division

June 1989

work supported by

U.S. DEPARTMENT OF ENERGY
Oak Ridge Operations
Oak Ridge, Tennessee

INTRODUCTION

The U.S. Department of Energy (DOE) issued the *Engineering Evaluation/Cost Analysis* [EE/CA] *for the Proposed Management of Contaminated Water in the Weldon Spring Quarry* (DOE/OR/21548-039) in January 1989. That EE/CA report examined various alternatives for management of contaminated water in the quarry; such management is needed because radioactive and chemical contaminants are migrating from the quarry pond into the local environment and the quarry is close to a county well field. The primary objective of the proposed action is to pump the contaminated water from the pond and to keep the pond pumped down, thereby limiting the potential for continued outward migration of contaminants.

This documentation is consistent with guidance from the U.S. Environmental Protection Agency (EPA) and with requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA). Following an evaluation of the various alternatives in the EE/CA, DOE determined that the best approach for management of the quarry water would be to treat the water to reduce contaminants to protective levels and then discharge the treated water to the Missouri River. The DOE applied for a permit from the Missouri Department of Natural Resources (DNR) under the National Pollutant Discharge Elimination System (NPDES) for release of this treated water to the Missouri River. The EE/CA provided a major source of technical input for this permit application.

The Missouri DNR conducted two public meetings regarding the permit application -- one on February 13, 1989, at the Ramada Westport in St. Louis, Missouri, and a second on February 14, 1989, at the Ramada Inn in Wentzville, Missouri. The DOE participated in these public meetings to provide additional information and answer questions consistent with the public participation process identified in CERCLA. Transcripts of the meetings are included as part of the administrative record associated with the proposed action. Questions raised by the public at these two meetings were addressed orally. The DOE has also received letters on the proposed action.

This document has been prepared to summarize and provide responses to the major issues identified in oral and written comments made regarding the proposed action. The first section presents general issues and responses. The second section, beginning on page 9, presents copies of letters received and responses to individual issues (comments) identified in these letters. An appendix, beginning on page 49, presents a floodplain assessment for the proposed action.

GENERAL ISSUES: COMMENTS AND RESPONSES

Issue 1

Comment. How does the proposed action relate to future actions at the quarry, such as evaluating the need to remove the bulk wastes and perform groundwater remediation?

Response. The proposed action is needed to respond to the current threat to the public and the environment from ongoing releases of contaminants from the quarry. This action is independent of future remedial action in the quarry area, but it is consistent with the proposed approach for remediation of the entire quarry.

Issue 2

Comment. How are public comments on the proposed action considered?

Response. Under CERCLA, the public is afforded an opportunity to provide meaningful input into the decision-making process for response actions at sites such as Weldon Spring. All public comments are retained in an administrative record that is available to the public. This EE/CA responsiveness summary has been prepared subsequent to DOE's receipt of public comments on the proposed action. Issues related to effluent release levels can be directed to the Missouri DNR in accordance with its rules and procedures under the NPDES permitting process.

Issue 3

Comment. The hazards of radiation exposure are not understood well enough to define a safe level of radiation exposure. In addition, the half-lives of uranium and thorium are so long that, once released to the environment, they remain a hazard for perpetuity.

Response. The risks of radiation exposure are understood better than those of many other carcinogens. The risks from low-level radiation exposure are conservatively estimated by extrapolating the risks from much higher rates of exposure. Uranium and thorium occur naturally in the environment. The increase in uranium concentration in the Missouri River as a result of the proposed action would be immeasurably small relative to naturally occurring levels. (See Section 5.2.1.1 of the EE/CA.)

Issue 4

Comment. Dilution of the contaminated water in the Missouri River is not an acceptable solution.

Response. Prior to discharge to the Missouri River, the quarry water would be extensively treated to meet federal and state standards and guidelines that are

protective of human health. The treatment goals were established without consideration of dilution. Discharge to the Missouri River is simply the most logical and environmentally acceptable means for managing this volume of treated water.

Issue 5

Comment. The statement is made in the EE/CA that the slough presents a hydrogeologic barrier to contaminant migration toward the county well field. This is not supported by current data. In addition, what about contaminant migration in the bedrock beneath the slough?

Response. The hydrogeology of the quarry area is complex. Current data indicate that the slough acts as at least a partial barrier to contaminant migration in the alluvium. There are many monitoring wells in the alluvium in the vicinity of the quarry (see Figure A.5 of the EE/CA). The concentrations of radionuclides are much lower in the monitoring wells south of the slough than in the wells north of the slough; the concentrations south of the slough are at background levels. Nitroaromatics were recently detected in monitoring wells just south of the slough, but the results of well resampling were negative. This detection of nitroaromatics may have resulted from the slough acting as only a partial barrier to contaminants migrating from the quarry via groundwater, i.e., by limiting the transport of radionuclides and metals, but not organics, beyond the slough. A more likely explanation is that the nitroaromatics originated from sediments in the slough itself (e.g., from past ordnance works discharges); this explanation is supported by the detection of nitroaromatics in these sediments during subsequent sampling.

Two additional observations support the migration-barrier hypothesis: (1) groundwater velocities in the vicinity of the slough are very low to almost stagnant and (2) water levels in the alluvium south of the slough are about 3 m (10 ft) lower than those in the slough itself. These are the bases for the statement in the EE/CA that the slough appears to act as a hydrogeologic barrier to contaminant transport toward the well field in the alluvium. Boreholes were taken in the vicinity of the slough to examine the vertical and horizontal profile of uranium contamination (see Figure A.6). Although this was not done to determine if the slough was acting as a hydrogeologic barrier, the information obtained from this investigation (shown in Figure A.7) is consistent with that hypothesis. However, over time, the slough may not continue to intercept contaminants migrating from the quarry toward the county well field. Thus, the continued quality of this drinking water supply may be jeopardized in the future. The DOE believes that it is imperative to eliminate the driving force for contaminant migration (i.e., the ponded water) as soon as possible. Monitoring of the well field would continue following removal and treatment of the quarry water. It is also possible that contamination may be moving in the bedrock beneath the slough toward the county well field. Plans are under way for expansion of the groundwater monitoring program to include bedrock sampling. Extensive monitoring will be continued to ensure the safety of the county well field until the problem is fully rectified.

Issue 6

Comment. The need for this action has not been demonstrated. Treatment of the contaminated quarry water should be delayed to allow for additional study of treatment alternatives. An alternate water supply to the county well field could be provided. Other alternatives should be examined for management of the contaminated water, such as evaporation or storage, until a better solution is identified.

Response. Contaminants in the quarry are known to be leaking to the groundwater in the direction of the St. Charles County well field (as discussed in Section 1.4 and Appendix A of the EE/CA). In order to respond to the resultant potential threat to public health and the environment, it is important to control the gradient for this migration by removing the water from the quarry. Under the proposed action, this water would be treated to protective levels and then discharged to the Missouri River. Provision of an alternate water supply was not considered as an alternative because the migration of contaminants has not yet affected the drinking water supply. A wide range of treatment alternatives was examined prior to selection of the conceptual design presented in the EE/CA. Factors that were considered in this evaluation included history of proven operation, local environmental factors, and consistency with the overall approach proposed for the quarry.

Issue 7

Comment. Has the proposed treatment approach been used elsewhere?

Response. The proposed water treatment plant utilizes conventional unit operations that have been successful in similar situations elsewhere. Small-scale treatability studies would be conducted prior to final design and construction of the treatment plant to ensure that the system would meet stringent performance specifications.

Issue 8

Comment. What is the time period during which the treatment plant would operate?

Response. The quarry pond currently contains 3 million gallons of water. Under the proposed action, the pond water -- as it was being removed for treatment -- would be replenished by both surface water and groundwater inflow. The treatment plant would be designed to operate at rates that would meet or exceed the rates of all potential inflows. The rate of operation would therefore reduce the hydraulic head in the area of the quarry pond such that the groundwater gradient in the immediate vicinity would reverse, thereby creating an active sump at the base of the quarry. This process might require two to five years or more to complete. The water treatment plant would continue to operate until there was no longer any reason to treat water at the quarry.

Issue 9

Comment. Would the treatment plant be used to treat other sources of contaminated water in addition to the quarry pond?

Response. The water treatment plant would be designed specifically to treat the radioactive and chemical contaminants in the quarry pond and all inflows to the pond. Other potential sources of inflow considered in determining the plant's capacity include: (1) surface runoff from the quarry and the immediate vicinity of the treatment plant (much of which would flow to the plant's equalization basin), (2) water used to decontaminate equipment during the planned removal of bulk waste from the quarry, (3) water used to wash down exposed rock surfaces during the bulk waste removal, and (4) incidental volumes of wastewater generated by related response actions at the quarry (see Table 12 of the EE/CA). As noted in Section 5.5 of the EE/CA, the treatment plant could also be used to treat contaminated groundwater if such action is deemed necessary in the future. The system would be conservatively designed to ensure an adequate capacity to respond to influent variations (including surface runoff from a 10-year, 24-hour storm) and to account for uncertainties in estimating inflows. The estimates of groundwater inflow reported in Table 12 are based on site characterization data, including historical (1960) data from pond-pumping tests performed by R.M. Richardson of the U.S. Geological Survey, and an approximation calculated using the Theis equation.

Issue 10

Comment. The conceptual design of the water treatment plant identified a synthetic membrane liner beneath the holding pond. Has the effect of organic contaminants such as 2,4-dinitrotoluene on the stability of the liner been investigated?

Response. The concentrations of organic contaminants are sufficiently low that no adverse impact on the liner is anticipated. However, this potential impact will be addressed during the detailed engineering design phase.

Issue 11

Comment. What monitoring would be done to ensure that the requirements of the NPDES permit were met?

Response. Treated water would be released from the treatment plant as a batch discharge, and DOE would test all water prior to release to ensure that the NPDES discharge limits were met. No treated water would be released to the Missouri River until it was in compliance with permit requirements. The Missouri DNR would independently monitor the treated water to ensure permit compliance. In addition, any interested party could split samples of the treated water for independent analysis. The incremental concentration of uranium in the Missouri River due to discharge of the treated water would be immeasurably small relative to naturally occurring levels.

However, DOE intends to monitor uranium levels at the intakes of downstream water treatment plants on the Missouri River.

Issue 12

Comment. The proposed discharge limit for uranium is too high. The limit should be reduced to levels as close to zero as possible.

Response. The DOE is committed to reducing releases of hazardous materials to the environment to levels that are as low as reasonably achievable (ALARA). Treatment technologies were analyzed thoroughly in the EE/CA. Based on this analysis, it was determined that reducing the uranium concentration to a level of 30 to 100 pCi/L was reasonably achievable. For the potential maximally exposed individual, the incremental risk of incurring a fatal cancer as a result of this treated water being released to the Missouri River is estimated to be less than one in two billion. Treating to lower levels would not reduce this negligible risk commensurate with the increased cost.

Issue 13

Comment. The risk analysis assumed rapid dilution in the Missouri River using river flow rates that do not represent a worst-case situation.

Response. Rapid dilution was conservatively assumed in the risk analysis because the downstream water intakes are on the opposite side of the Missouri River from the discharge. Assuming incomplete mixing would have resulted in a lower risk estimate. The flow rate in the Missouri River was assumed to be 280 m^3/s (10,000 ft^3/s). At no time would the treated water be released to the Missouri River if the flow rate was less than this value. This conservative flow rate was based on input from the Missouri DNR (see Section 5.2.1.1 of the EE/CA) and the Kansas City District, U.S. Corps of Engineers. Using conservative assumptions, the incremental risk to the potential maximally exposed individual is estimated to be less than one in two billion. The actual risk is much lower.

Issue 14

Comment. How will worker safety be guaranteed?

Response. The DOE has established requirements in DOE Order 5480.11 to ensure the safety of occupationally exposed individuals. A major component of these requirements is the commitment to reduce occupational exposures to ALARA levels, consistent with project requirements. The water treatment plant would be designed to minimize exposure to radioactive and chemical materials. The plant would be built adjacent to the quarry, and all process wastes would be packaged and stored in the quarry, thereby reducing occupational exposures from these wastes. Workers would be trained with regard to the hazards associated with radiation and chemical exposure and would be

provided with appropriate protective equipment as needed. A record of occupationally incurred exposure would be maintained and made available to each worker. The estimated levels of exposure associated with the proposed action are considerably below those necessary for any protective measures. However, DOE is committed to fully evaluating the potential for exposure to ensure not only compliance with regulatory requirements but also implementation of the ALARA process.

Issue 15

Comment. What would happen to the wastes generated by plant operation?

Response. The wastes would be packaged in containers and stored in the quarry in a designated area, pending a decision on the disposition of all bulk wastes currently being stored in the quarry. The impact associated with storage of these wastes would be low. An estimated volume of 22 m^3 (28 yd^3) of process wastes would be generated per year. The surface exposure rate associated with these packaged wastes is estimated to be 10 μR/h. The current exposure rate in the quarry, which is highly variable with location, averages about 60 μR/h.

Issue 16

Comment. Removal of the quarry water could result in increased releases of radon gas as solid wastes are uncovered and the water table in the bulk wastes is lowered.

Response. Radon gas emissions may increase somewhat as the quarry water is removed and treated. However, the major source of radon gas emissions causing the elevated readings at the quarry perimeter is the surficial deposit of radium-contaminated wastes on the eastern side of the quarry, not the area covered by the pond. Neither removing the pond water nor lowering the water table in the bulk wastes would affect radon releases from those areas that are currently causing the elevated levels. Monitoring systems and contingency plans would be in place to identify and respond to increases in radon levels at the quarry perimeter, as appropriate, if such increases occurred.

Issue 17

Comment. The potential for adverse environmental impacts, e.g., on local biota and archeological resources, should be considered.

Response. The effects of the proposed action on local biotic populations would be minimal. The water treatment plant would be constructed in a relatively small area outside the currently fenced quarry. The size of the affected area, 5.6 ha (14 acres), would be negligible relative to the size of the surrounding wildlife area, 6,000 ha (15,000 acres). Although mobile wildlife could be displaced during the action period, the quarry area does not provide unique wildlife habitat and its plant species are not restricted in distribution (see Section 5.2.1.2 of the EE/CA). A positive effect that

would result from removing the contaminated water is the reduced potential for future biological uptake of radioactive and chemical contaminants originating from the quarry pond or from areas to which the contaminants may have migrated.

In Section 4.1 of the EE/CA, it was stated that an archeological survey of the quarry area potentially affected by the proposed action would be conducted prior to the initiation of any response activities. The area has been surveyed, and one archeological site was found (Missouri file number 23SC709). This site consists of a small quantity of stone flakes in the uppermost portion of the modern soil that appears to have been disturbed by past railroad construction activities. It does not meet the criteria for inclusion in the *National Register of Historic Places*, which are listed in 36 CFR 60.4. This determination is based on the recommendations of the survey report, which have been supported by the Missouri Department of Natural Resources, Division of Parks, Recreation, and Historic Preservation. The DOE will obtain a "formal determination of no effect" from the State Historic Preservation Officer pursuant to the National Historic Preservation Act prior to initiating the proposed action.

Based on the preliminary engineering design for the proposed treatment system, one of the two effluent ponds and the below-grade discharge pipe would be partially located in the 100-year floodplain of the Missouri River. Therefore, a floodplain assessment has been prepared for the proposed action and is attached as an appendix to this responsiveness summary. As described in the floodplain assessment, no significant adverse impacts are expected to result from this action. Potential impacts to floodplain habitat and biota would be similar to those discussed for the treatment plant location (see Section 5.2.1.2 of the EE/CA). In fact, the overall emphasis of the proposed action is to improve environmental conditions in the quarry area, which includes the Missouri River floodplain.

WRITTEN COMMENTS AND RESPONSES

Letters on the proposed action were received from the following individuals:

- Robert L. Morby (Chief, Superfund Branch, Waste Management Division, U.S. Environmental Protection Agency Region VII, Kansas City, Kansas) -- letter to Rodney R. Nelson dated December 23, 1988;

- William C. Ford, P.E. (Director, Division of Environmental Quality, Missouri Department of Natural Resources, Jefferson City, Missouri) -- letter to Robert L. Morby dated January 19, 1989;

- Louise McKeon Belt (St. Louis, Missouri) -- letter to Steve McCracken and Roger Nelson dated February 17, 1989;

- Marilyn Spirt Lanson (St. Louis, Missouri) -- letter to Christopher Bond (U.S. Senator from Missouri) dated February 28, 1989; and

- Robert J. York (Acting Chief, Installation Restoration Program, U.S. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland) -- letter to Rod Nelson dated March 15, 1989.

The letters from Robert L. Morby and William C. Ford were received prior to publication of the final version of the EE/CA, and revisions based on the issues raised in these letters were included in the final EE/CA, as appropriate.

Each of these letters has been assigned an identification letter according to date of receipt, and specific issues within each letter have been identified with a number. For example, the earliest letter received is Letter A; issues (comments) identified within Letter A are labeled A-1, A-2, and so forth; and the respective responses to these comments are labeled Response A-1, Response A-2, and so forth. A copy of each letter is reproduced in this section, and the responses to identified comments are presented on succeeding pages.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VII
726 MINNESOTA AVENUE
KANSAS CITY, KANSAS 66101

DEC 2 3 1988

Mr. Rodney R. Nelson
U. S. Department of Energy
Weldon Spring Site Remedial
Action Project
Route 2, Highway 94 South
St. Charles, Missouri 63303

Dear Mr. Nelson:

We have reviewed the revised "Engineering Evaluation/Cost Analysis for the Proposed Management of Contaminated Water in the Weldon Spring Quarry" dated December 1988. In general, the revised document is well developed, technically sound, and adequately addresses most of our comments from our September 28, 1988 meeting.

We believe the EE/CA document, in its current form, is sufficient to allow meaningful public comment on the proposed action. Outlined below are aspects of the proposal which require further clarification; however, we believe that these concerns can be appropriately addressed in the responsiveness summary.

A-1 5.1 Requirements Potentially Relevant to the Proposed Action. Tables 9 & 10 contain potential effluent discharge limits, however the text contains inadequate discussion on what criteria was used to determine the appropriate cleanup levels. Also, Table 9 does not appear to contain an effluent limit with the superscript letter c as the footnotes would indicate. Table 2 and this section should have included the Missouri Safe Drinking Water Act and the Missouri Public Drinking Water Regulations.

A-2 5.2.1.2 Environmental Risk Analysis. This section does not address the potential ecological impacts of effluent discharge to the Missouri River. The last sentence on page 60 says "In terms of residual contaminant levels, the treated water would meet effluent requirements that are based on ensuring protection of human health and the environment, including biotic populations (see sections 5.2.1.1 and 5.5)." However, potential ecological impacts on the Missouri River were not discussed in these additional sections either.

A-3 5.5 Treatment Plant Specifications. Descriptions of the monitoring program do not indicate what specific parameters are to be monitored. Will the program include monitoring for those contaminants which do not currently, but potentially could exceed appropriate discharge limits at some point during plant operation?

Response A-1

Tables 9 and 10 include consideration of the Missouri Safe Drinking Water Act and the Missouri Public Drinking Water Regulations. The cleanup levels were conservatively identified, e.g., from drinking water standards, where available, as identified in the footnotes to the tables. The superscript c in Table 9 appears after the "asbestos" entry in the first column. (Note: the 8-hour time-weighted average for asbestos given in Section 5.1.1.10 of the EE/CA should be 0.2 fibers/cm^3, corrected from 2.0 fibers/cm^3.)

Response A-2

The EE/CA includes a discussion of the river component of environmental impacts in Section 5.2.1.2 (page 61). The reference to Sections 5.2.1.1 and 5.5 is related to the effluent requirements, which in certain cases (e.g., ambient water quality criteria) include consideration of biotic populations other than humans. In addition, plans are currently under way to assess potential impacts on fathead minnows from the release of treated water.

Response A-3

The monitoring requirements are included in the NPDES permit issued by the Missouri DNR and address (1) parameters to be monitored, (2) sample type, and (3) monitoring location and frequency, as appropriate.

A-4 5.5 Treatment Plant Specifications. The plan should specify performance criteria, if not the actual specifications, for containment and storage of the process wastes.

Thank you for the opportunity to review the revised EE/CA. Please call if you have any questions.

Sincerely yours,

Gale A. Wright

Robert L. Morby
Chief, Superfund Branch
Waste Management Division

cc: David Bedan, MDNR

Response A-4

The performance criteria and specifications for the containment and storage of process wastes would be included with those for the treatment system in the final design package.

JOHN ASHCROFT
Governor
G. TRACY MEHAN, III
[redacted]
Director

STATE OF MISSOURI
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL QUALITY
P.O. Box 176
Jefferson City, MO 65102

Division of Energy
Division of Environmental Quality
Division of Geology and Land Survey
Division of Management Services
Division of Parks, Recreation,
and Historic Preservation

January 19, 1989

Mr. Robert L. Morby, Chief
Superfund Branch
Waste Management Division
U.S. Environmental Protection Agency, Region VII
726 Minnesota Avenue
Kansas City, Kansas 66101

Dear Mr. Morby,

The Missouri Department of Natural Resources (MDNR) has reviewed the Engineering Evaluation/Cost Analysis for the Proposed Management of Contaminated Water in the Weldon Spring Quarry (USDOE/OR/21548-039, December 1988).

The document is generally well written and adequately documents the need to remove the contaminated water from the Quarry in order to remove the bulk waste from the Quarry.

The contaminated water should be treated to drinking water standards. In the case of uranium, where there is no drinking water standard, the levels should be as low as reasonably achievable. In no case should water exceeding 100 pCi/l of uranium be discharged. The proposed design goal of treating the water to 30 pCi/l should be adequate for achieving this level. Specific comments are attached.

The MDNR will also require that the U.S. Department of Energy apply for a state NPDES permit to discharge the non-radioactive contaminants in the water.

The MDNR has also consulted with the Missouri Department of Health (MDOH) regarding the risk analysis for the proposal and the MDOH has concurred that the proposed levels are protective of human health. MDOH's comments are attached.

If you have any questions on these comments please contact me or Dr. David Bedan of my staff.

Sincerely,

DIVISION OF ENVIRONMENTAL QUALITY

William C. Ford, P.E.
Director

DEB/cjj

Attachments

cc: Mr. Ron Kucera, Deputy Director, MDNR
Dr. David Bedan, DEQ Administration
Mr. Robert Hentges, WPCP
Mr. Jerry Lane, Director, PDWP
Ms. Hilda Chaski, MDOH
Mr. Rod Nelson, USDOE

Missouri Department of Natural Resources Comments on EE/CA for Weldon Springs Quarry Water Treatment Proposal (Dec 1988)

B-1 Page 20, Table 2: The listing of Missouri requirements should include the Missouri Safe Drinking Water Act and Rules.

B-2 Page 41, Table 9: A footnote should be added to indicate EPA has proposed to change the drinking water standard for lead from 0.05 mg/l to 0.005 mg/l.

B-3 Page 42, Table 9: The concentration and potential effluent limit for Gross Beta should be included. Footnote [e] should indicate that a drinking water standard for uranium is being considered by EPA.

B-4 Page 43, Table 10: The concentrations and potential limits for Gross Alpha and Gross Beta should be included.

B-5 Page 59, Section 5.2.1.2: Is the 170 cubic yards of process wastes per year a dry volume? If so, how will wastes be dried? Does this volume include wastes from the ion exchange units?

B-6 Page 66, last paragraph: A discussion of in-stream monitoring in the Missouri River should be added. Samples should taken upstream and downstream of the point of effluent discharge and at the St. Louis County and St. Louis City water intakes at mile 37.

Response B-1

The noted requirements are included in Table 2 and Section 5.1.3 of the EE/CA.

Response B-2

Although the proposed revision is not included in the EE/CA, the treatment system would be modified to accommodate such a revision if it were promulgated and determined to be either applicable or relevant and appropriate to the release of treated water into the Missouri River.

Response B-3

Consideration of a proposed standard is difficult when no actual numbers are available; thus, an addition to footnote e of Table 9 was not included. However, the issue would be addressed, as appropriate, if such a standard were promulgated. The limit for gross beta was not included in the table because, based on characterization data (see Appendix A of the EE/CA), it is neither applicable nor relevant and appropriate to the proposed action.

Response B-4

Gross alpha as such is not a contaminant that requires treatment; therefore, it is not included in Table 10. In the quarry water, gross alpha is essentially represented by uranium, and uranium is included in Table 10. (Measured differences between gross alpha and uranium levels in Table 9 reflect differences in the respective analytical methods.) Gross beta is not included in Table 10 for the reasons discussed in Response B-3.

Response B-5

Process wastes are discussed in Section 5.5 of the EE/CA. The total volume of dewatered process wastes, including ion-exchange wastes, is estimated to be 22 m^3 (28 yd^3) per year. The wastes would be dewatered using a conventional process (e.g., filter press) that would be identified in the final design package for the proposed treatment system.

Response B-6

In-stream monitoring requirements, including those identified here, are established in the NPDES permit issued by the Missouri DNR.

MEMORANDUM

Missouri Department of HEALTH

TO: Dave Bedan
Division of Environmental Quality
Administration
Department of Natural Resources

FROM: Daryl W. Roberts
Chief
Bureau of Environmental Epidemiology

SUBJECT: Comments on Weldon Spring Quarry Water Treatment Plant

DATE: December 15, 1988

The following comments pertain to three issues that were raised and discussed at the coordination meeting of December 7, 1988, at Weldon Spring. All these issues relate to the Quarry Water Processing Plant.

B-7 1. The treatment process that was recommended for clean-up of the quarry water was targeted to reduce the uranium level of the effluent to 30 pCi/L, but in actual practice that level would range between 30 and 100 pCi/L. We would concur with the Department of Natural Resources (DNR) suggestion of expressing this as "the effluent level will range from 30-100 with an average of about 60 pCi/L". This further implies that 100 pCi/L would be the maximum level discharged into the river, and indeed this level will be guaranteed.

B-8 2. With regard to the question of whether the 100 pCi/L level is protective of public health we would refer to the memorandum to you of December 12, 1988 (attached) which discusses some health aspects of the contaminants of concern at the quarry. Based on the Department of Energy's (D.O.E.) Missouri River Plume Study of December 1, 1988, the 100 pCi/L uranium level in the effluent would be diluted immediately to a concentration of from 2×10^{-2} to 2×10^{-4} pCi/L in the river water. And in the Revised Final Draft report on the Quarry Plant of November 1988, the D.O.E. states that the incremental uranium concentration in the river following its receipt of the effluent flow would be about 0.0007 pCi/L at the intakes of the water treatment plants. This extra amount of radiation in the river water would result in an increased risk of 4.6×10^{-10} to any one maximally exposed individual, and in considering the entire exposed population, the odds are 1.3×10^{-7} that someone in that population will be affected. The latter figure is based on a population of 1,000,000 but DNR has determined that the exposed population would be closer 1.5 million.

Response B-7

This issue was addressed in the published EE/CA.

Response B-8

This issue was addressed in the published EE/CA.

3. The third issue involves the removal of lead. Since lime softening and ion exchange are individual steps in the treatment process, most of the lead should be removed through these processes. Experience has shown that lime softening will remove insoluble lead and ion exchange will remove the soluble form. Furthermore, the dilution effect of the river would reduce the concentration of lead to well below the proposed drinking water standard of 0.005 mg/l, even if no lead were removed from the influent stream; the quarry water has a lead concentration of about 0.04 mg/l.

This assessment is based on the assumption that all the uranium and lead in the effluent flow stays in the water and is not lost in the sediment of the river, and is not removed through the treatment processes at the downstream water treatment plants. Thus, it would appear that the process proposed for treating the quarry water would reduce the uranium and lead content to levels that would be protective of public health.

If you have any questions, please contact Gale Carlson or Dr. Richard Gnaedinger at (314) 751-6102.

DWR:RHG:vlh